

SPECIFICATION API

● The grade designations used herein for grades A&B do not include reference to the specified minimum yield strength. Other grade designations used herein comprise the letter A or X followed by the first two digits of the specified minimum yield strength.

● Pipes manufactured as grade X 60 or higher shall not be substituted for pipes ordered for grade X 52 or lower without purchaser approval.

● Electric – weld pipe : is defined as pipe having one longitudinal seam formed by electric resistance welding or electric – induction welding without the addition of extraneous metal. The weld seam of electric – resistance welded pipe and induction welded pipe in grades higher than X 42 shall be heat treated after welding to a minimum temperature of 1000 °F (538 °C). For grades X 42 and lower the

weld seam shall be similarly heat treated, or the pipe shall be processed in such a manner that no untempered martensite remains.

● Submerged – Arc weld pipe : is defined as pipe having one longitudinal seam formed by automatic submerged – arc welding. Welding must be made on inside and outside.

● Pipe furnished to this specification shall be made from open – hearth, electric furnace, or basic – oxygen steel. Spiral weld skelp widths shall not be less than 0.8 or more than 3 times the pipe OD. (Outside diameter).

● Skelp end welds in finished spiral weld pipe permitted only at distances greater than 12 in from the ends of the pipe. Such welds shall be made by one of the processes mentioned for spiral welding, or by the electric – flash welding process. Skelp ends shall be properly prepared for welding.

● **Chemical requirements for heat analysis (%) :**

Grade	Carbon	Manganese	Phosphorus		S	Cb.	V	Ti
	(max.)	(Min.)	(Max.)	(Min.)	(Max.)	(Max.)	(Min.)	(Min.)
A 25 Cl. I	0.21	0.30	0.60		0.045	0.06		
A 25 Cl. II	0.21	0.30	0.60	0.045	0.06			
A	0.21		0.90		0.05			
B	0.26		1.15		0.04	0.05		
x 42	0.28		1.25		0.04	0.05		
x 46, x 52 Non – expand.	0.30		1.35		0.04	0.05		
x 46, x 52 cold expand	0.28		1.25		0.04	0.05		
x 56, x 60	0.26		1.35		0.04	0.05	0.005	0.02
x 65	0.26		1.40		0.04	0.05	0.005	0.02
x 70	0.23		1.60		0.04	0.05		

● When requested by the purchaser, the manufacturer shall furnish a report giving the heat analysis of each heat of steel used in the manufacture of pipe furnished on the purchase order. The analysis so determined shall conform to the requirements specified. For grade A 25, the manufacturer may certify that the material furnished has been analysed and meets the chemical requirements of API Spec. 5L.

● **Product analysis :**

One test from each of two lengths of pipe or plate or skelp from each lot size as indicated below shall be analysed for product analyses by the manufacturer. The results of the analyses shall be available to the purchaser on request.

Grade	Size (in.)	Lot size
A 25	$\leq 1 \frac{1}{2}$ nom.	25 tons or fraction.
A 25	≥ 2 nom.	50 tons or fraction.
A & B	$2 \frac{3}{8}$ through $5 \frac{9}{16}$	400 lengths or less.
A & B	$6 \frac{5}{8}$ through $12 \frac{3}{4}$	200 lengths or less.
× 42 and higher	$2 \frac{3}{8}$ through $12 \frac{3}{4}$	200 lengths or less.
All grades	14 and over	100 lengths or less.

● **Permissible variations for product analysis (%) :**

Carbon	+ 0.04 %
Manganese :	
All grades through B.	+ 0.05 %
where minimum is specified.	- 0.05 %
Grade × 42 and higher.	+ 0.10 %
Phosphorus	+ 0.01 %
Where minimum is specified.	- 0.01 %
Sulfur	+ 0.01 %
Vanadium	- 0.01 %
Titanium	- 0.01 %

● **Mechanical properties :**

The minimum elongation in 2 in. (50.80 mm) shall be determined by the following formula :

$$e = 625000 \frac{A^{0.2}}{U^{0.9}} \quad \text{or} \quad e = 1942.57 \frac{A^{0.2}}{U^{0.9}}$$

(English Formula)

(Metric Formula)

where

e = minimum elongation in percent to

nearest $\frac{1}{2}$ % .

A = cross – sectional area of the tensile test specimen in sq. in. (m m.) based on specified outside diameter or nominal specimen width and specified wall thickness rounded to the

nearest 0.01 sq. in (6.5 mm²) or 0.75 sq. in. (484 mm²) whichever is smaller.

U = specified minimum ultimate tensile strength, psi (10³ Newton / m² = Mpa).

Tensile Requirements

Grade	Yield strength (min.)		Ultimate tensile strength (min.)	
	Psi	Mpa	Psi	Mpa
A 25	25000	172	45000	310
A	30000	207	48000	331
B	35000	241	60000	413
× 42	42000	289	60000	413
× 46	46000	317	63000	434
× 52	52000	358	66000 ¹	455 ¹
			72000 ²	496 ²
× 56	56000	386	71000 ¹	489 ¹
			75000 ²	517 ²
× 60	60000	413	75000 ¹	517 ¹
			78000 ²	537 ²
× 65	65000	448	77000 ¹	530 ¹
			80000 ²	551 ²
× 70	70000	482	82000	565
× 80	80000	551	90000	620

1 – For pipe less than 20 in. OD with any wall thickness and for pipe 20 in. OD and larger

with wall thickness greater than 0.375 in. 2 – For pipe 20 in. OD and larger with wall thickness 0.375 in. (9.5 mm) and less .

● **tensile test :**

At the option of the manufacturer for straight seam welded pipe, the longitudinal specimens may be taken from the skelp parallel to the rolling direction and approximately midway between edges and center. Testing procedure shall conform to the requirements of ASTM A - 370. Strip specimens shall be approximately 1 1/2 in. (38.1 mm) wide in gage length if suitable curved face testing grips are used or if the ends of the specimens are machined to reduce the curvatures in the grip area, otherwise they shall be approximately 3/4 in. (19 mm) wide for

pipe 3 1/2 in. and smaller, approximately 1 in. (25.4 mm) wide for pipe 4 in. through 6 5/8 in. and approximately 1 1/2 in. (38.1 mm) wide for pipe 8 5/8 in. and larger. Alternately, when grips with curved faces are not available, the ends of the specimens may be flattened without heating. All tensile tests, except transverse weld and ring tests, shall include yield strength, ultimate tensile strength, and elongation determinations, and shall be performed with the specimen at room temperature. The strain rate shall be in accordance with the requirements of ASTM A - 370 .

Frequency of tensile testing

Size (in.)	Tensile tests	weld tensile tests	Mill control tensile tests
≦ 1 1/2 nom. A 25	1 per 25 tons or fraction		
≧ 2 nom. A 25	1 per 50 tons or fraction		
≦ 5 9/10 OD except A 25	1 per 400 lengths		
≧ 6 5/8 OD thr. 12 3/4 OD	1 per 200 lengths		One per heat on
≧ 12 3/4 OD	1 per 100 lengths		all sizes except
8 5/8 thr. 12 3/4 OD		1 per 200 lengths	for grade A 25
≧ 12 3/4 OD		1 per 100 lengths	

● **Transverse tensile tests :**

The transverse tensile properties shall be determined at the option of the manufacturer, by one of the following methods :

a - The yield strength, ultimate strength, and

elongation values shall be determined on either a flattened rectangular specimen or a round bar specimen.

b - The yield strength shall be determined by

the ring expansion method, with the ultimate strength and elongation values determined from a flattened rectangular specimen.

The same method of testing must be employed for all lots in an order item. All specimens shall represent the full wall thickness of the pipe from which the specimen was cut, except for round bar specimens.

● **weld tensile tests :**

Specimens for this test shall be taken at 90° to the weld with the weld at the center. All specimens shall represent the full wall thickness of the pipe from which the specimen was cut, weld tensile tests need not include determination of yield strength and elongation.

● **Mill control tensile tests :**

One tensile test shall be made as a mill control for each heat of steel used by the manufacturer for production of pipe except for grade A 25. A record of such tests shall be available to the purchaser. Except spiral welds, these tensile tests shall be made on either the skelp or the finished pipe at the option of the manufacturer.

● **Retests :**

If the tensile test specimen representing a lot of pipes fails to conform to the specified requirements, the manufacturer may elect to make retests on two additional lengths from the same lot. If both retest specimens conform to the requirements, all the lengths in the lot shall be accepted, except the length from which the initial specimen was cut. If one or both of the retest specimens fail to conform to the specified requirements, the manufacturer may elect to test individually the remaining lengths in the lot, in which case determinations are required only for the particular requirements with which the specimens failed to comply in the preceding tests. Specimens for retest shall be taken in the same manner as the specimen which failed to meet the minimum requirements.

● **Bend tests :**

For grade A 25 pipes 2 in. nom. and smaller, one full – section specimen of appropriate length, cut from a length of pipe from each lot of 25 tons, or fraction thereof of pipe 1 1/2 in. nom. and smaller, and from each lot of 50 tons or fraction thereof, of 2 in. nom. pipe, shall be bent cold through 90°, around a mandrel having a diameter not greater than 12 x outside diameter of the pipe being tested, with the weld located approximately 45° from the point of contact of the specimen with the mandrel. No cracks shall occur in any portion of the pipe, and no opening shall occur in the weld. If the specimen fails to conform to these requirements the manufacturer may elect to make retests on specimens cut from two additional lengths from the same lot. If all retest specimens conform to the specified requirements, all lengths in the lot shall be accepted, except the length from which the initial specimen was taken. If one or more of the retest specimens fail to conform to the specified requirements, the manufacturer may elect to repeat the test on specimens cut from the individual lengths remaining in the lot.

● **Weld ductility test :**

For electric – welded pipe, the weld ductility shall be determined by tests on full – section specimens of 2 in. (50.8 mm) minimum length. The specimens shall be flattened cold between parallel plates. The weld shall be placed 90° from the direction of applied force (point of maximum bending). No crack or breaks exceeding 1/8 in. (3.18 mm) in direction in the weld or the parent metal shall occur on the outside surface until the distance between the plates is less than value of S calculated by the formulas (a) & (b) :

(a) Grades less than x 52 :

$$S = \frac{3.07 t}{0.07 + 3 \frac{t}{D}}$$

(b) Grades x 52 or higher :

$$S = \frac{3.05 t}{0.05 + 3 \frac{t}{D}}$$

where :

S = Distance between flattening plates, in. (mm).

t = Specified wall thickness of the pipe, in. (mm).

D = Specified outside diameter of the pipe, in. (mm).

If the weld ductility test specimen representing a lot of pipes fails to conform to the requirements mentioned before the manufacturer may elect to make retests on two additional lengths from the same lot. If both retest specimens conform to the requirements, all the lengths in the lot shall be accepted except the length from which the initial specimen was taken. If one or both of the retest specimens fail to conform to the requirements, the manufacturer may elect to test specimens cut from one end of the individual lengths remaining in the lot. precautions shall be taken so that the specimens can be identified with respect to the length of pipe from which they were cut.

● **Hydrostatic tests :**

Each length of pipe shall withstand, without leakage, a mill inspection hydrostatic test to at least the pressure specified. Test pressures for welded pipes in sizes 18 in. and smaller, shall be held for at least 5 sec. Test pressures for welded pipes in sizes 20 in. and larger shall be held for not less than 10 sec. Each tester shall be equipped with a recording gage that will record the test pressure and duration of time applied to each length of pipes. Such records or charts shall be available for examination at the mill by the purchaser's inspectors. The minimum test pressure shall be the standard test pressure or alternate test pressure as listed in the following tables, for different steel grades, pipe sizes, and wall thicknesses of the tested pipes.

- **Dimensions, weights, and lengths :**
- **Outside diameter :**

permissible variations shall be as follows.

1.9 in. and smaller	+ 0.016 in. (+ 0.41 mm) - 0.031 in. (- 0.79 mm)
2 3/8 in. through 18 in.	± 0.75 %
20 in. through 36 in.	(Non - expanded) ± 1 %
20 in. through 36 in.	(+ 0.75 %) (cold expanded) (- 0.25 %)
larger than 36 in.	(Non - expanded) ± 1 %
larger than 36 in.	(+ 1/4 in. (+ 6.35 mm) (cold expanded) - 1/8 in. (- 3.2 mm)

Pipe 10 3/4 in. and smaller, shall not be more than 1/64 in (0.4 mm) smaller than the specified outside diameter for a distance of 4 in. (101.6 mm) from the end of pipe, and shall permit the passage over the ends, for a distance of 4 in (101.6 mm) of a ring gage which has a bore 1/16 in. (1.59 mm) larger than the specified outside diameter of the pipe. Pipe 12 3/4 in. to 20 in. inclusive, shall not be more than 1/32 in. (0.79 mm) smaller than the specified outside diameter for a distance of 4 in. (101.6 mm) from the end of the pipe, and shall permit passage over the ends for a distance of 4 in. (101.6 mm) of a ring gage which has a bore 3/32 in. (2.38 mm) larger than the specified outside diameter of the pipe.

● **wall thickness :**

the wall thickness at any place shall be within the tolerances specified in the tables, except that the weld area shall not be limited by the plus tolerance. Wall thickness measurements shall be made with a mechanical caliper or with a properly calibrated non - destructive inspection device to appropriate accuracy. In case of dispute, the measurement determined by use of mechanical caliper shall govern.

● **Permissible variations shall be as follows :**

Size (OD.), in.	Tolerance, %	
	Grade A,B,A25 × 42 thr. × 80	
2.875 and Smaller.	+ 20 - 12.5	+ 15 - 12.5
3.50	+ 18 - 12.5	+ 15 - 12.5
4 through 18	+ 15 - 12.5	+ 15 - 12.5
20 and larger	+ 17.5 - 10	+ 19.5 - 8

● **weight :**

Each length of pipe 5 ⁹/₁₆ in. and larger shall be weighed separately, and the carload weights determined. lengths of pipe 4 ¹/₂ in. and smaller shall be weighed either individually or in convenient lots, at the option of the manufacturer, and the carload weights determined. A carload is considered to be a minimum of 40000 lb (18144 kg). Threaded and coupled pipe shall be weighed with the couplings screwed on, but without thread protectors.

Permissible allowances in weight shall be as follows:

● **Single lengths :**

Standard – weight, regular – weight, + 10 %
 extra – strong, and double – extra, – 3.5%
 strong pipe. Except grade A25. + 10 %
 Special plain – end pipe, A25 pipe. – 5 %

● **Carload lots :**

all grades except A 25. – 1.75%
 grade A 25. – 2.5 %

● **Length :**

when the pipe is furnished with threads and couplings, the length shall be measured to the outer face of the coupling.

Tolerances on lengths

	shortest length in entire shipment	shortest length in 95% of entire shipment	shortest length in 90% of entire shipment	Minimum average length, entire shipment
Threaded – and – coupled pipe :				
Single random Lengths.	16 ft (4.88m)	18 ft (5.49m)		
Double random lengths.	22 ft (6.71m)			35 ft (10.67m)
Plain – end pipe :				
single random lengths.	9 ft (2.74m)			17.5 ft (5.33m)
Double random lengths.	14 ft (4.27m)		26.3 ft (8m)	35 ft (10.67m)
As agreed upon lengths in excess of 20 ft (6.1 m).	40 % of average agreed upon.		75% of average agreed upon.	

● **pipe ends and thread protectors :**

Threaded ends shall conform to the threading, thread inspection, and gaging requirements specified in API std. 5 B. One end of threaded pipe shall be provided with a coupling, and the other end with thread protection. A highgrade thread compound shall be applied to cover the full surface of either the coupling or pipe engaged thread before making up the joint. All exposed threads shall be coated with a high – grade thread compound, unless otherwise specified on the purchasing order .

● **Thread protectors :**

On pipe sizes smaller than 2 in. nominal, the thread protectors shall be suitable fabric wrapping, or suitable metal, fiber, or plastic protectors. On pipe sizes 2 in. nominal and larger, the thread protectors shall be of such design, material, and mechanical strength to protect the thread and end of the pipe from damage under normal handling and transportation. The thread protectors shall cover the full length of the thread on the pipe and exclude water and dirt from the thread during

transportation and normal storage. Normal storage period shall be considered as approximately one year. Protector material shall contain no compounds capable of causing corrosion or promoting adherence of the protectors to the threads and shall be suitable for service temperatures of -50°F to $+150^{\circ}\text{F}$ (-46°C to $+66^{\circ}\text{C}$).

● **Plain ends :**

Unless otherwise ordered, plain – end pipe (other than double extra – strong pipes) in sizes $2\frac{3}{8}$ in. and larger shall be furnished with ends beveled to an angle of $30^{\circ} + 5^{\circ} - 0^{\circ}$, measured from a line drawn perpendicular to the axis of the pipe, and with a root face of $\frac{1}{16}$ in. \pm $\frac{1}{32}$ in. (1.59 ± 0.79 mm).

● **Couplings :**

Couplings for grades A and B pipes shall be seamless and shall be made of a grade of a material at least equal in mechanical properties to that of the pipe. Couplings for grade A 25 pipe shall be seamless or welded and shall be made of steel. By agreement between the purchaser and the manufacturer, welded couplings may be supplied on pipe 14 in. and larger, if the couplings are properly marked. A tensile test shall be made on each heat of steel from which couplings are produced, and the coupling manufacturer shall maintain a record of such tests. This record shall be open to inspection by the purchaser. Coupling threads, gaging practice and thread inspection shall conform to the requirements of API std. 5B Couplings shall be free from blisters, pits, cinder marks and other defects which would impair the efficiency of the coupling or break the continuity of the thread.

● **Non – destructive inspection :**

Submerged – arc welded pipe shall be inspected by radiological methods, on the full length, or for a distance of 8 in. (203 mm) or 4 in. (102 mm) for spiral weld, from each end if the balance of the length is inspected by ultrasonic methods .

Electric – welded pipe shall be inspected by ultrasonic or electromagnetic methods .

● **Marking and coating :**

Pipe and pipe couplings, manufactured in conformance with this specification, shall be marked by the manufacturer as specified .

The required marking on couplings shall be die stamped unless otherwise agreed upon between the purchaser and the manufacturer, in which case they shall be paint stenciled .

size, weight per foot, length, and hydrostatic test pressure markings shall be in english units, except pipe intended for use in countries utilizing the metric system : these markings shall be in metric units or both english and metric units .

● **Location of markings :**

1.9 in. OD and smaller : Die stamped on a metal tag fixed in the bundle, or may be printed on the straps or banding clips used to tie the bundle. Pipe sizes up to 16 in. OD : Paint stencil on the outside surface starting at a point between 18 and 30 inches from the end of the pipe. Marking may be done on the inside surface with certain sequence convenient to the manufacturer if agreed upon between purchaser and manufacturer. Pipe 16 in. OD and larger : Paint stencil on the inside surface starting at a point not less than 6 in. from the end of the pipe in a sequence convenient to the manufacturer.

● **Sequence of Markings :**

- a – Manufacturer's Name or Mark.
- b – Spec 5L : paint stenciled when the product is in complete compliance with this specification.
- c – Size : in inches.
- d – Weight per foot.
- e – Grade : used symbols : A25, A,B, x 42, x 46, x 52, x 56, x 60, x 70, x 80.
If columbium, vanadium, and/or titanium is present, the grade symbol shall be followed by the letters c,v,t or combination thereof.

f – Process of manufacture :

- E welded pipe.
- SW spiral welded pipe.

g – Type of steel :

- E electric – furnace steel.
- R rephosphorized steel (class II).

h – Heat treatment :

- HN Normalized or normalized and tempered.
- HS subcritical stress relieved.
- HA subcritical age hardened.
- HQ Quenched and tempered.

j – Test pressure : When the specified hydrostatic test pressure is higher than the tabulated pressure (in the tables), the test pressure in psi preceded by the word TESTED shall be paint stenciled .

● **Examples :**

- 1 – 6 $\frac{5}{8}$ in., 18.97 lb, Grade B, electric – welded open – hearth, regular weight,

plain – end pipe, shall be paint stenciled as follows:

AB CO Spec 5L * 6 $\frac{5}{8}$ 18.97 BE.

- 2 – 12 $\frac{3}{4}$ in., 43.77 lb, Grade X 42, submerged – arc. spiral weld, basic oxygen steel pipe, shall be paint stenciled as follows:

ABCO Spec 5L * 12 $\frac{3}{4}$ 43.77 X 42 SW .

● **Length marking :**

For pipes in sizes larger than 1.9 in. OD, the length in feet and tenths of foot, unless otherwise specified on the purchase order, as measured on the finished pipe shall be paint stenciled on the outside surface at a place convenient to the manufacturer. Length marking may be placed on the inside surface by agreement between the purchaser and the manufacturer. For sizes 1.9 in. OD and smaller, the total length of pipe in the bundle in feet and tenths of a foot, unless otherwise specified on the purchase order, shall be marked on the tag, band, or clip .

● **Coatings :**

Unless otherwise ordered, pipe shall be given a mill – coating to protect it from rusting in transit. If bare or specially coated pipe is desired, the purchase order should so state. For special coatings, the purchase order should state further whether the coating is to be applied to the full length or whether a certain specified distance from the end is to be left uncoated. Unless otherwise specified, such bare ends are commonly given a coating with oil for protection in transit.

* * * *

nominal diam.	outside diameter		Wall thickness		weight Kg/m	nominal diam.	outside diameter		Wall thickness		weight Kg/m
	inch	mm	inch	mm			inch	mm	inch	mm	
2	2.375	60.3	0.083	2.1	3.014	4	4.5	114.3	0.109	2.8	7.699
			0.109	2.8	3.971				0.125	3.2	8.768
			0.125	3.2	4.506				0.141	3.6	9.828
			0.141	3.6	5.034				0.156	4.0	10.881
			0.172	4.4	6.066				0.172	4.4	11.925
			0.188	4.8	6.570				0.188	4.8	12.962
			0.218	5.5	7.433				0.203	5.2	13.991
2½	2.875	73.	0.109	2.8	4.847	5	5.563	141.3	0.125	3.2	10.898
			0.125	3.2	5.508				0.156	4.0	13.544
			0.141	3.6	6.161				0.188	4.8	16.158
			0.156	4.0	6.807				0.219	5.6	18.741
			0.172	4.4	7.444				0.281	7.1	23.498
			0.188	4.8	8.073				0.312	7.9	25.990
			0.216	5.5	9.156				0.344	8.7	28.450
3	3.5	88.9	0.250	6.4	10.512	6	6.625	168.3	0.141	3.6	14.622
			0.083	2.1	4.495				0.156	4.0	16.208
			0.109	2.8	5.945				0.172	4.4	17.785
			0.125	3.2	6.763				0.188	4.8	19.314
			0.141	3.6	7.573				0.203	5.2	20.916
			0.156	4.0	8.375				0.219	5.6	22.470
			0.172	4.4	9.169				0.312	7.9	13.250
			0.188	4.8	9.955				0.344	8.7	34.243
			0.250	6.4	13.012				0.375	9.5	37.204
			0.281	7.1	14.323						
0.3	7.6	15.238									
3½	4.0	101.6	0.083	2.1	5.153	8	8.625	219.1	0.188	4.8	25.368
			0.108	2.8	6.822				0.219	5.6	29.485
			0.125	3.2	7.765				0.250	6.4	33.571
			0.141	3.6	8.701				0.312	7.9	41.147
			0.156	4.0	9.588				0.344	8.7	45.142
			0.172	4.4	10.482				0.375	9.5	49.106
			0.188	4.8	11.411						
			0.250	6.4	14.963						
0.281	7.1	16.477									

TABLE : DIMENSIONS WEIGHTS, AND TEST PRESSURES

1		2		3		4		5		6		7		8		9		10		11		12		13		14	
Size outside Diameter.		Weight		wall Thickness		inside Diam.		Grade A		Grade B		Test pressure Kglcm ² min.															
in	D mm.	lb/ft	Kg/m.	in.	t mm	mm	d	Std.	All.	Std.	All.	Grade		Grade		Grade											
												x 42	x 15	x 52	x 56	x 60	x 65										
6 3/8	168.3	10.78	16.06	0.156	3.96	160.4	60	75	70	87	104	114	128	139	143	211											
		11.85	17.65	0.172	4.37	159.6	65	82	77	86	115	126	143	153	165	211											
		12.92	19.24	0.188	4.78	158.7	72	90	84	105	126	138	155	167	179	211											
		13.92	20.73	0.203	5.16	158.0	77	97	91	113	136	148	168	181	194	211											
		14.98	22.31	0.219	5.56	157.2	84	105	98	122	146	160	181	195	209	211											
		17.02	25.35	0.250	6.35	155.6	96	120	111	139	167	183	207	211	211	85											
8 5/8	219.1	14.11	21.02	0.156	3.96	211.2	46	57	53	67	80	88	99	107	115	124											
		16.94	25.23	0.188	4.78	209.5	55	69	65	80	96	105	120	129	138	150											
		18.26	27.20	0.203	5.16	208.8	-	-	-	-	104	114	129	141	149	16											
		19.66	29.28	0.219	5.56	208.0	64	80	75	93	112	123	139	150	161	174											
		22.36	33.31	0.250	6.35	206.4	73	91	86	107	129	141	153	171	183	193											
		24.70	36.73	0.277	7.04	205.0	82	102	95	119	142	156	176	190	203	211											
10 3/4	273.0	17.65	26.29	0.156	3.96	265.1	37	46	43	53	78	79	90	97	104	112											
		21.21	31.59	0.188	4.78	263.4	44	56	51	65	88	96	109	117	125	136											
		22.87	34.06	0.203	5.16	262.7	-	-	-	-	95	104	117	127	136	147											
		24.83	36.69	0.219	5.56	261.9	51	65	60	75	102	112	127	136	146	158											
		28.04	41.77	0.250	6.35	260.3	59	74	69	86	117	128	145	155	167	181											
		31.20	46.47	0.279	7.09	258.8	65	82	77	96	130	143	161	174	186	202											
12 3/4	323.8	23.11	34.42	0.172	4.37	315.1	54	63	40	50	67	74	84	90	97	105											
		25.22	37.57	0.188	4.78	314.2	57	68	44	54	74	81	91	98	105	115											
		27.20	40.51	0.203	5.16	313.5	-	-	-	-	80	88	99	107	114	124											
		29.31	43.66	0.219	5.56	312.7	44	54	51	63	86	94	107	115	123	134											
		33.38	49.72	0.250	6.35	311.1	50	62	58	72	98	108	122	131	141	153											
		37.42	55.74	0.281	7.14	309.5	56	70	65	82	110	121	137	148	158	172											
		41.45	61.74	0.312	7.92	308.0	62	77	72	90	123	134	152	164	176	190											
		43.77	65.20	0.330	8.38	307.0	65	82	77	96	130	142	161	173	186	201											
		45.58	67.89	0.344	8.74	306.5	68	85	79	100	136	148	168	181	193	209											

1		2		3		4	5		6		7		8		9		10		11		12		13		14	
Size Outside Diameter		Weight		Wall Thickness		Inside Diameter	Test Pressure kg/cm ² min																			
in	mm	lb/ft	kg/m	in	mm		Grade A		Grade B		Grade	Grade	Grade	Grade	Grade	Grade										
						Std.	Alt.	Std.	Alt.	X42	X46	X52	X56	X60	X65											
14	355.6	27.75	41.30	0.188	4.78	346.0	34	42	39	49	67	74	84	90	98	108										
		29.91	44.55	0.203	5.16	345.3	37	46	43	53	-	-	-	-	-	-										
		30.95	46.07	0.210	5.33	344.9	-	-	-	-	75	82	93	101	108	117										
		32.25	48.01	0.219	5.56	344.5	-	-	-	-	79	86	97	105	112	122										
		36.71	54.68	0.250	6.35	342.9	45	56	53	66	90	98	111	120	128	138										
		41.17	61.32	0.281	7.14	341.3	51	63	59	74	101	110	124	134	144	156										
		45.61	67.94	0.312	7.92	339.8	56	70	66	82	112	122	138	149	160	173										
		50.17	74.75	0.344	8.74	338.1	62	78	72	91	123	135	153	165	176	191										
		54.57	81.28	0.375	9.52	336.6	67	85	79	99	134	147	167	179	192	208										
		58.94	87.79	0.406	10.31	335.0	-	-	-	-	146	160	180	194	208	211										
16	406.4	31.75	47.29	0.188	4.78	396.8	30	37	34	44	59	65	73	79	84	91										
		34.25	51.02	0.203	5.16	396.1	32	40	37	47	64	70	79	85	91	98										
		36.91	54.98	0.213	5.56	395.3	34	44	40	51	69	75	85	91	98	106										
		42.05	62.63	0.250	6.35	393.7	39	49	46	58	79	86	97	105	112	122										
		47.17	70.26	0.281	7.14	392.1	44	56	52	65	88	96	109	117	126	136										
		52.27	77.86	0.312	7.92	390.6	49	62	58	72	98	107	121	131	140	151										
		57.52	85.68	0.344	8.74	388.9	54	68	63	79	108	118	134	144	154	167										
		62.58	93.21	0.375	9.52	387.4	59	74	69	86	117	129	146	157	168	182										
		67.62	100.72	0.406	10.31	385.8	-	-	-	-	127	139	157	170	182	197										
18	457.2	35.76	53.26	0.188	4.78	447.6	27	33	31	39	53	58	65	70	75	81										
		41.59	61.95	0.219	5.56	446.1	31	39	36	45	61	67	76	82	87	94										
		47.39	70.59	0.250	6.35	444.5	35	44	41	51	70	77	86	93	100	108										
		53.18	79.21	0.281	7.14	442.9	39	49	46	58	78	86	97	105	112	122										
		58.94	87.79	0.312	7.92	441.4	44	55	51	64	87	96	108	116	124	135										
		64.87	96.62	0.344	8.74	439.7	49	60	56	70	96	105	119	128	137	148										
		70.59	105.14	0.375	9.52	438.2	53	66	62	77	105	115	129	139	149	162										
		76.29	113.63	0.406	10.31	436.6	-	-	-	-	113	124	140	151	162	175										
		82.15	122.36	0.438	11.13	434.9	62	77	72	90	122	134	151	163	174	189										
		87.81	130.79	0.469	11.91	433.4	-	-	-	-	131	143	162	174	187	202										
93.45	139.19	0.500	12.70	431.8	70	88	82	103	139	153	173	186	199	211												

TABLE 3 DIMENSIONS¹ WEIGHTS, AND TEST PRESSURES

1		2		3		4		5	6	7	8	9	10	11	12	13	14	
Size outside Diameter.		Weight		wall Thickness		inside Diam.		Test pressure Kg/cm ² min.										
								Grade A		Grade B								
in D mm.		lb/ft	Kg/m.	in . , mm		mm		Std.	Alt.	Std.	Alt.	x 42	x 15	x 52	x 56	x 60	x 65	
20	508.0	46.27	68.92	0.219	5.56	496.9	27	34	32	40	58	64	72	77	83	90		
		52.73	78.54	0.250	6.35	495.3	32	39	37	46	66	73	82	89	95	103		
		59.18	88.15	0.281	7.14	493.7	36	44	41	52	75	82	93	100	107	115		
		65.60	97.71	0.312	7.92	492.2	39	49	46	58	83	91	103	110	118	129		
		72.21	107.56	0.344	8.74	490.5	44	54	51	63	91	100	113	122	131	141		
		78.60	117.07	0.375	9.52	489.0	48	59	56	69	100	109	124	133	142	154		
22	558.8	50.94	75.88	0.219	5.56	547.7	25	32	30	37	55	58	65	70	76	82		
		58.07	86.50	0.250	6.35	546.1	29	36	34	42	60	66	75	81	86	93		
		65.18	97.09	0.281	7.14	544.5	32	40	38	47	68	75	84	91	97	105		
		72.27	107.65	0.312	7.92	543.0	36	45	42	52	75	82	93	101	108	117		
		79.56	118.50	0.344	8.74	541.3	39	49	46	58	83	91	103	111	119	128		
		86.61	129.01	0.375	9.52	539.8	43	54	51	63	81	90	112	121	129	140		
24	609.6	63.41	94.45	0.250	6.35	596.9	27	33	31	39	56	60	69	74	79	86		
		71.18	106.02	0.281	7.14	595.3	30	37	34	43	63	68	77	83	89	96		
		78.33	117.57	0.312	7.92	593.8	33	41	39	48	69	76	86	92	98	107		
		86.91	129.45	0.344	8.74	592.1	37	45	42	53	76	84	94	101	109	118		
		94.62	140.84	0.375	9.52	590.6	39	49	46	58	83	91	103	111	119	129		
		102.31	152.39	0.406	10.31	589.0	-	-	-	-	90	98	111	120	129	139		
26	660.4	68.75	102.40	0.250	6.35	647.7	25	30	28	35	51	56	63	68	73	79		
		77.18	114.36	0.281	7.14	646.1	27	34	32	40	58	63	71	77	82	89		
		85.60	127.50	0.312	7.92	644.6	30	38	35	44	64	70	79	85	91	98		
		94.26	140.40	0.344	8.74	642.9	34	42	39	49	70	77	87	93	101	109		
		102.63	152.87	0.375	9.52	641.4	37	46	43	53	77	84	95	102	110	119		
		110.98	165.30	0.406	10.31	639.8	-	-	-	-	83	91	103	110	119	129		
28	711.2	74.09	110.36	0.250	6.35	698.5	22	28	26	33	48	52	59	63	67	73		
		83.19	123.91	0.281	7.14	696.9	25	32	30	37	53	58	66	71	76	82		
		92.26	137.42	0.312	7.92	695.4	28	35	33	41	59	65	73	79	84	91		
		101.61	151.35	0.344	8.74	693.7	-	-	-	-	65	72	81	87	93	101		
		110.64	164.80	0.375	9.52	692.2	34	42	39	49	71	78	88	95	102	110		
		119.65	178.22	0.406	10.31	690.6	-	-	-	-	77	84	96	103	110	120		
		128.33	192.04	0.438	11.13	688.9	39	49	46	58	83	91	103	111	119	129		

TABLE 3 DIMENSIONS¹ WEIGHTS, AND TEST PRESSURES

1		2		3		4	5	6	7	8	9	10	11	12	13	14
Size outside Diameter		Weight		Wall thickness		inside Diam	Test pressure kg/cm ² min									
in	mm	lb./ft	Kg./m	in	mm	mm	Std	Alt	Std	Alt	< 42	> 15	> 52	> 56	> 60	> 65
30	762.0	79.43	118.91	0.250	6.35	749.9	21	26	25	31	44	49	55	59	63	67
		83.13	132.85	0.281	7.14	747.7	24	30	27	34	50	55	62	66	71	75
		86.83	147.36	0.312	7.92	746.2	26	33	31	39	56	60	68	74	79	84
		108.95	162.28	0.344	8.74	744.5	-	-	-	-	61	67	75	82	87	91
		118.65	176.73	0.375	9.52	743.0	32	39	37	46	66	73	82	89	95	101
		128.32	191.15	0.405	10.31	741.4	-	-	-	-	72	79	89	96	103	111
		138.23	205.98	0.438	11.13	739.7	37	46	43	54	77	85	96	103	111	120
32	812.8	84.77	126.26	0.250	6.35	800.1	20	25	23	29	41	46	51	56	59	64
		95.13	141.79	0.281	7.14	798.5	22	28	26	32	46	51	58	63	67	71
		105.58	157.28	0.312	7.92	797.0	25	31	29	36	52	57	64	69	74	82
		116.30	173.23	0.344	8.74	795.3	-	-	-	-	57	63	71	76	82	87
		126.66	188.66	0.375	9.52	793.8	30	37	34	44	63	68	77	83	89	95
		136.99	204.03	0.408	10.31	792.2	-	-	-	-	67	74	84	90	96	104
		147.64	219.91	0.438	11.13	790.5	34	44	40	51	72	79	90	97	104	112
34	863.6	90.11	134.22	0.250	6.35	850.9	18	23	22	27	39	43	49	52	56	60
		101.19	150.72	0.281	7.14	849.8	21	26	25	30	44	48	54	58	63	66
		112.25	167.20	0.312	7.92	847.8	23	29	27	34	49	53	60	65	70	75
		123.65	184.18	0.344	8.74	846.1	-	-	-	-	53	59	67	72	77	81
		134.81	200.99	0.375	9.52	844.6	28	35	32	41	58	64	72	78	84	91
		145.67	218.98	0.408	10.31	843.0	-	-	-	-	63	70	79	84	91	98
		157.00	239.85	0.438	11.13	841.3	32	41	38	48	68	75	85	91	98	106
36	914.4	167.93	250.16	0.463	11.91	839.8	-	-	-	-	73	80	91	98	105	113
		178.89	264.44	0.500	12.70	838.2	37	46	44	54	78	86	97	104	112	121
		85.49	142.17	0.250	6.35	901.7	18	22	20	25	37	41	46	49	53	57
		107.20	159.67	0.281	7.14	900.1	20	25	23	29	41	46	51	56	59	64
		118.92	177.13	0.312	7.92	898.6	22	27	26	32	46	51	57	61	66	71
		131.00	195.12	0.344	8.74	896.9	-	-	-	-	51	56	63	67	72	79
		142.68	212.52	0.375	9.52	895.4	27	33	31	39	56	60	69	74	79	86
38	965.2	154.34	229.89	0.406	10.51	893.8	-	-	-	-	60	65	73	80	86	93
		166.33	247.78	0.438	11.13	892.1	31	39	36	45	65	71	80	86	92	100
		177.97	269.09	0.469	11.91	890.6	-	-	-	-	69	76	86	92	99	107
		189.37	282.36	0.500	12.70	889.0	35	44	41	51	74	81	91	98	105	114
		129.38	187.05	0.312	7.92	949.4	21	26	24	30	44	48	54	58	63	67
		138.93	206.07	0.344	8.74	947.7	23	29	27	34	48	53	60	64	69	75
		150.69	224.49	0.375	9.52	946.2	25	31	29	37	53	58	65	70	75	81
38	965.2	163.01	242.80	0.406	10.51	944.6	27	34	32	38	57	62	70	76	81	88
		175.71	261.72	0.438	11.13	942.9	29	37	34	43	61	67	76	82	87	95
		187.99	280.01	0.469	11.91	941.4	31	39	37	46	65	72	82	87	95	101
		200.25	298.27	0.500	12.70	939.8	33	41	39	49	70	77	86	93	100	108

TABLE 3 DIMENSIONS¹ WEIGHTS, AND TEST PRESSURES

1		2		3		4	5		6		7		8		9		10		11		12		13		14	
Size outside Diameter.		Weight		wall Thickness		inside Diam.																				
in D mm.		lb/ft	Kg/m.	in.	mm	mm	Grade A		Grade B		Grade		Grade		Grade											
							Std.	Alt.	Std.	Alt.	x 42	x 15	x 52	x 56												
40	1016.0	132.25	196.99	0.312	7.92	1000.2	20	25	23	29	41	46	51	56	59	64										
		143.69	217.01	0.344	8.74	998.5	22	27	25	32	46	50	56	61	65	71										
		158.70	236.58	0.375	9.52	997.0	24	30	27	34	50	55	62	66	71	77										
		171.68	255.72	0.406	10.31	995.4	26	32	30	37	54	59	67	72	77	84										
		185.06	275.65	0.438	11.13	993.7	27	34	32	40	58	64	72	77	83	90										
		198.01	294.94	0.469	11.91	992.2	30	37	34	44	63	68	77	83	89	96										
		210.93	314.18	0.500	12.70	990.6	32	39	37	46	68	73	82	89	95	103										
42	1066.8	153.04	227.95	0.344	8.74	1049.3	20	26	24	30	44	48	54	58	62	67										
		166.71	248.31	0.375	9.52	1047.6	22	28	27	33	48	52	59	63	67	73										
		180.35	268.63	0.406	10.31	1046.2	23	30	29	36	51	56	63	68	73	79										
		194.42	289.59	0.438	11.13	1044.5	27	33	31	39	56	60	69	74	79	86										
		208.03	309.86	0.469	11.91	1043.0	28	35	33	41	59	65	74	79	85	92										
		221.61	330.69	0.500	12.70	1041.4	30	38	35	44	63	70	78	84	91	98										
		44	1117.6	160.39	238.90	0.344	8.74	1100.1	20	25	23	29	41	46	51	56	59	64								
174.72	260.25			0.375	9.52	1098.6	22	27	25	32	45	50	56	60	65	70										
189.03	281.56			0.406	10.31	1097.0	23	30	27	34	49	53	60	65	70	76										
203.78	303.53			0.438	11.13	1095.3	25	32	30	37	53	58	65	70	76	82										
218.04	324.77			0.469	11.91	1093.8	27	34	32	39	57	62	70	75	81	88										
232.29	346.00			0.500	12.70	1092.2	29	36	34	42	60	66	75	81	86	93										
46	1168.4			167.74	249.85	0.344	8.74	1150.9	19	24	22	27	40	44	49	53	57	61								
		182.73	272.18	0.375	9.52	1149.5	20	26	24	30	44	48	53	58	62	67										
		197.70	294.47	0.406	10.31	1147.8	22	28	26	32	47	51	58	63	67	72										
		213.13	317.46	0.438	11.13	1146.1	24	30	28	35	51	56	63	67	72	78										
		228.06	339.70	0.469	11.91	1144.6	26	32	30	38	54	59	67	72	77	84										
		242.97	361.90	0.500	12.70	1143.0	27	34	32	40	58	63	72	77	82	89										
		48	1219.2	175.08	260.78	0.344	8.74	1201.7	18	22	21	27	38	41	47	51	54	59								
190.74	284.11			0.375	9.52	1200.2	20	25	23	29	41	46	51	56	59	64										
206.37	307.39			0.406	10.31	1198.6	21	27	25	31	45	49	56	60	64	70										
222.49	331.40			0.438	11.13	1196.9	23	29	27	34	49	53	60	65	70	75										
238.08	354.62			0.469	11.91	1195.4	25	31	29	36	52	57	64	69	75	80										
253.65	377.81			0.500	12.70	1193.8	27	33	31	39	56	60	69	74	79	86										

**Specification B.S. 1387 -- 1967 -- Light
ISO R/65 -- Light I & II
Light weight threaded pipe**

Nominal size			Outside diam.		Coupling				wall thickness				Theoretical weight of black pipe																			
in	mm	in	mm	Min. outside diam.		Min length		in	mm	in	mm	in	mm	with plain ends		with threads & couplings																
				in	mm	in	mm							lb/ft	Kg/m	lb/ft	Kg/m	lb/ft	Kg/m	lb/ft	Kg/m	lb/ft	Kg/m									
1/4	8	0.531	13.5	1 1/16	17.5	6 3/64	25	0.08	2					0.385	0.573																	
3/8	10	0.677	17.2	2 7/32	21.5	1 1/32	26	0.08	2	0.072	1.8			0.502	0.747	0.453	0.674	0.506	0.753	0.457	0.680											
1/2	20	0.838	21.3	1 1/16	27	1 11/32	34	0.092	2.35	0.080	2.0			0.737	1.10	0.640	0.952	0.743	1.11	0.646	0.961											
3/4	25	1.059	26.9	1 5/16	33.5	1 27/64	36	0.092	2.35	0.092	2.35			0.948	1.41	0.944	1.41	0.958	1.42	0.954	1.42											
1	32	1.327	33.7	1 9/32	40.5	1 11/16	43	0.115	2.9	0.104	2.65			1.49	2.21	1.35	2.01	1.50	2.23	1.36	2.03											
1 1/4	40	1.669	42.4	1 31/32	50	1 57/64	48	0.115	2.9	0.104	2.65			1.91	2.84	1.73	2.58	1.93	2.87	1.75	2.61											
1 1/2	50	1.901	48.3	2 1/4	57	1 57/64	48	0.115	2.9	0.116	2.9			2.19	3.26	2.19	3.25	2.22	3.30	2.22	3.29											
2	65	2.374	60.3	2 13/4	70	2 13/64	56	0.128	3.25	0.116	2.9			3.06	4.56	2.76	4.11	3.11	4.63	2.81	4.18											
2 1/2	80	2.996	76.1	3 25/64	86	2 9/16	65	0.128	3.25	0.128	3.25			3.90	5.81	3.90	5.80	3.98	5.93	3.98	5.92											
3	100	3.500	88.9	3 15/16	100	2 51/64	71	0.144	3.65	0.128	3.25			5.14	7.65	4.58	6.81	5.25	7.82	4.69	6.98											
4	114.3	4.500	114.3	4 61/64	126	2 17/64	83	0.160	4.05	0.144	3.65			7.39	11.0	6.64	9.89	7.59	11.3	6.84	10.2											

Theoretical weights of galvanized pipe approx. 6% high.
Coupling to DIN 2986 (1 S 0/R 50).

Tolerances :

Minimum wall thickness at any point shall not be more than 12.5% under the nominal specified wall thickness.

Required testing :

Flattening test : for pipes in normal bore over 2.
Bend test : Full section bend for pipe in OD 2 and under.

Permissible variations in weight :

Per each length of pipe $\pm \begin{matrix} 10\% \\ 8\% \end{matrix}$
Per each lot of minimum 500 Pcs $\pm 4\%$

2. BS 1387 Steel Tubes and Tubulars

● **Light**

Nominal Bore		Outside Diameter				Thickness		Weight of Black Tube			
		max.	min.	max.	min.			Plain End		Screwed and Socketed	
in.	mm	in.	in.	mm	mm	in.	mm	lbs/ft	kg/m	lbs/ft	kg/m
1/8	6	0.396	0.383	10.1	9.7	0.072	1.8	0.243	0.361	0.245	0.364
1/4	8	0.532	0.518	13.6	13.2	0.072	1.8	0.347	0.517	0.350	0.521
3/8	10	0.671	0.656	17.1	16.7	0.072	1.8	0.453	0.674	0.457	0.680
1/2	15	0.841	0.825	21.4	21.0	0.080	2.0	0.640	0.952	0.646	0.961
3/4	20	1.059	1.041	26.9	26.4	0.092	2.35	0.944	1.41	0.954	1.42
1	25	1.328	1.309	33.8	33.2	0.104	2.65	1.35	2.01	1.36	2.03
1 1/4	32	1.670	1.650	42.5	41.9	0.104	2.65	1.73	2.58	1.75	2.61
1 1/2	40	1.903	1.882	48.4	47.8	0.116	2.9	2.19	3.25	2.22	3.29
2	50	2.370	2.347	60.2	59.6	0.116	2.9	2.76	4.11	2.81	4.18
2 1/2	65	2.991	2.960	76.0	75.2	0.128	3.25	3.90	5.80	3.98	5.92
3	80	3.491	3.460	88.7	87.9	0.128	3.25	4.58	6.81	4.69	6.98
4	100	4.481	4.450	113.9	113.0	0.144	3.65	6.64	9.89	6.84	10.2

● Medium

Nominal Bore		Outside Diameter				Thickness		Weight of Black Tube			
		max.	min.	max.	min.			Plain End		Screwed and Socketed	
in.	mm	in.	in.	mm	mm	in.	mm	lbs/ft	kg/m	lbs/ft	kg/m
1/8	6	0.411	0.386	10.4	9.8	0.080	2.0	0.273	0.407	0.275	0.410
1/4	8	0.547	0.522	13.9	13.3	0.092	2.35	0.437	0.650	0.440	0.654
3/8	10	0.685	0.660	17.4	16.8	0.092	2.35	0.573	0.852	0.577	0.858
1/2	15	0.856	0.831	21.7	21.1	0.104	2.65	0.822	1.22	0.828	1.23
3/4	20	1.072	1.047	27.2	26.6	0.104	2.65	1.06	1.58	1.07	1.59
1	25	1.346	1.316	34.2	33.4	0.128	3.25	1.64	2.44	1.65	2.46
1 1/4	32	1.687	1.657	42.9	42.1	0.128	3.25	2.11	3.14	2.13	3.17
1 1/2	40	1.919	1.889	48.8	48.0	0.128	3.25	2.43	3.61	2.46	3.65
2	50	2.394	2.354	60.8	59.8	0.144	3.65	3.42	5.10	3.47	5.17
2 1/2	65	3.014	2.969	76.6	75.4	0.144	3.65	4.38	6.51	4.46	6.63
3	80	3.524	3.469	89.5	88.1	0.160	4.05	5.69	8.47	5.80	8.64
4	100	4.524	4.459	114.9	113.3	0.176	4.5	8.14	12.1	8.34	12.4
5	125	5.534	5.459	140.6	138.7	0.192	4.85	10.9	16.2	11.2	16.7
6*	150	6.539	6.459	166.1	164.1	0.192	4.85	12.9	19.2	13.3	19.8

* The 6 1/2 in (165.1 mm) o.d. size (6 in « 150 mm » nominal bore) is no longer standard and should be used only where screwing into BS 21 pipe threads is unavoidable .

● Heavy

Nominal Bore		Outside Diameter				Thickness		Weight of Black Tube			
		max.	min.	max.	min.			Plain End		Screwed and Socketed	
In.	mm	In.	In.	mm	mm	In.	mm	lbs/ft	kg/m	lbs/ft	kg/m
1/8	6	0.411	0.386	10.4	9.8	0.104	2.65	0.331	0.439	0.333	0.496
1/4	8	0.547	0.522	13.9	13.3	0.116	2.9	0.517	0.769	0.520	0.773
3/8	10	0.685	0.660	17.4	16.8	0.116	2.9	0.686	1.02	0.690	1.03
1/2	15	0.858	0.831	21.7	21.1	0.128	3.25	0.977	1.45	0.983	1.46
3/4	20	1.072	1.047	27.2	26.6	0.128	3.25	1.27	1.90	1.28	1.91
1	25	1.348	1.316	34.2	33.4	0.160	4.05	2.00	2.97	2.01	2.99
1 1/4	32	1.687	1.657	42.9	42.1	0.160	4.05	2.58	3.84	2.60	3.87
1 1/2	40	1.919	1.889	48.8	48.0	0.160	4.05	2.98	4.43	3.01	4.47
2	50	2.394	2.354	60.8	59.8	0.176	4.5	4.14	6.17	4.19	6.24
2 1/2	65	3.014	2.965	76.6	75.4	0.176	4.5	5.31	7.90	5.39	8.02
3	80	3.524	3.469	89.5	88.1	0.192	4.85	6.76	10.1	6.87	10.3
4	100	4.524	4.459	114.9	113.3	0.212	5.4	9.71	14.4	9.91	14.7
5	125	5.534	5.459	140.6	138.7	0.212	5.4	12.0	17.8	12.3	18.3
6*	150	6.539	6.459	166.1	164.1	0.212	5.4	14.3	21.2	14.7	21.8

* The 6 1/2 in (165.1 mm) o.d. size (6 in « 150 mm » nominal bore) is no longer standard and should be used only where screwing into BS 21 pipe threads is unavoidable .

* * * *

SPECIFICATION DIN 2458

Steel tubes for hollow sections

Permissible variations in dimensions :

Outside diameter of tube : $\pm 1\%$

Wall thickness :

up to 3 mm	+	0.30 mm
	-	0.25 mm
above 3 mm	+	0.45 mm
	-	0.35 mm

Permissible variations in weight :

Per single tube + 12%
- 8%

Per wagon load of 10 t min. + 10%
- 5%

Permissible variations in length :

up to 6 m (approx. 20 ft) + 10 mm
above 6 m (approx. 20 ft) + 15 mm

Water test pressure :

50 – 80 kp/ mm² (700 – 1000 psi).

outside diameter		Standard wall thickness		Weight	
in	mm	in	mm	lbs/ft	Kg/m
1 1/16	17.2	0.078	2	0.507	0.754
25/32	20.	0.078	2	0.598	0.890
27/32	21.3	0.078	2	0.646	0.962
63/64	25	0.078	2	0.76	1.13
1 1/16	26.9	0.078	2	0.83	1.24
1 3/16	30	0.078	2	0.93	1.39
1 1/4	31.8	0.078	2	0.99	1.48
1 11/32	33.7	0.078	2	1.05	1.57
1 1/2	38	0.078	2	1.20	1.79
1 11/16	42.4	0.078	2	1.35	2.01
1 3/4	44.5	0.078	2	1.42	2.11
1 29/32	48.3	0.091	2.3	1.77	2.63
2	51	0.091	2.3	1.87	2.78
2 1/4	57	0.091	2.3	2.10	3.13
2 3/8	60.3	0.091	2.3	2.22	3.31
2 1/2	63.5	0.091	2.3	2.35	3.50
2 3/4	70	0.102	2.6	2.92	4.35
3	76.1	0.102	2.6	3.19	4.75
3 1/4	82.5	0.102	2.6	3.47	5.16
3 1/2	88.9	0.114	2.9	4.17	6.20
4	101.6	0.114	2.9	4.78	7.11
4 1/4	108	0.114	2.9	5.09	7.57
4 1/2	114.3	0.126	3.2	5.93	8.83

Rectangular & square hollow sections :

es sharp edges
er round edges

- Thnsile strength 37 – 45 kp/mm²
- Elongation at fracture = min. 25%

Dimensions		Wall	weight		Dimensions		Wall	weight		Dimensions		Wall	weight		Dimensions		Wall	weight	
		thick	kg/m				thick	kg/m				thick	kg/m				thick	kg/m	
mm	mm	mm	es	er	mm	mm	mm	es	er	mm	mm	mm	es	er	mm	mm	mm	es	er
20	20	2.0	1.10		55	34	2.0	2.64	2.59	30	30	2.5	2.12	2.03	60	30	2.5	3.29	3.21
25	25	2.0	1.42	1.36	60	20	2.0	2.36	2.31	35	35	3.0	2.95	2.83			3.0	3.90	3.77
28	20	2.0	1.36	1.30		30	2.0	2.67	2.62	40	20	2.5		2.03		35	3.0	4.13	4.01
30	15	2.0	1.26			35	2.0	2.83	2.78		25	4.0		3.26		40	2.5		3.60
	20	2.0	1.42	1.36		40	2.0	2.99	2.93		28	2.5	2.43	2.35			3.0		4.25
	30	2.0	1.73	1.68		60	3.0	5.31	5.19		30	2.5	2.51	2.43			4.0		5.45
32	32	2.0	1.86	1.80	65	40	3.0	4.60				3.0	2.95	2.83		60	4.0		6.71
34	34	2.0	1.98	1.93	70	35	3.0	4.60				4.0		3.57	70	40	4.0		6.08
35	20	2.0	1.58			40	3.0	4.84	4.72		40	2.5	2.9	2.82		70	4.0		7.97
	35	2.0	2.05	1.99		50	4.0		6.71			3.0	3.43	3.30	80	40	4.0		6.71
40	20	2.0	1.73	1.68		60	3.0	5.78	5.66			4.0		4.20		50	4.0		7.34
	25	2.5	1.89	1.84		70	3.0		6.13	50	20	2.5	2.51	2.43		60	4.0		7.97
42	28	2.0	1.98	1.93	80	40	3.0	5.31	5.19		25	2.5	2.71	2.62		80	4.0		9.22
	30	2.0	2.05	1.99		50	3.0	5.78	5.66		30	2.5	2.90	2.82	100	40	4.0		7.97
	35	2.5	2.71	2.62		60	3.0		6.13			3.0	3.43	3.30	100	60	4.0		9.22
44	40	2.0	2.36	2.31		80	3.0	7.19	7.07			4.0		4.20	120	40	4.0		9.22
	42	4.0		4.45	90	45	2.5	5.06	4.98	50	35	2.5	3.10	3.01		60	4.0		10.48
45	30	4.0		3.88	100	40	3.0		6.13			3.0	3.66	3.54					
50	20	2.0	2.05	1.99		50	3.0	6.72			40	2.5	3.29	3.21					
	25	2.0	2.20	2.15		60	3.0	7.19	7.07			3.0	3.90	3.77					
	30	2.0	2.36	2.31	120	40	3.0	7.19	7.07		50	2.5		3.6					
	34	2.0	2.49	2.43		60	3.0		8.01			3.0		4.25					
	35	2.0	2.52	2.46								4.0		5.45					
	40	2.0	2.67	2.62															
	50	2.0		2.93															

Permissible weight variations :

Individual tubes	± 10 %
Shipments 10 tons min.	± 7.5%

Permissible length variations :

from 1000 up to 2000 mm	+ 2 mm
above 2000 up to 5000 mm	+ 5 mm
above 5000 mm	+ 10 mm
approximate lengths	± 100 mm

* * * *

SPECIFICATION DIN 1626

For welded steel pipes manufactured from:
unalloyed and low alloy steels.

Chemical analysis & Mechanical properties :

Steel grade	Ladle analysis %max.			Tensile Strength Kp/mm ²	Yield Point (min) (Kp/mm ²) for wall thick		Elongation % (min)
	C	P	S		up to 16 mm	above 16 – 40 mm	
	St. 33					33 – 50	
St. 34 – 2	0.17	0.05	0.05	34 – 42	21	21	26
St. 37	0.20	0.08	0.05	37 – 45	24	23	23
St. 37 – 2	0.20	0.06	0.05	37 – 45	24	23	23
St. 42	0.25	0.08	0.05	42 – 50	26	25	20
St. 42 – 2	0.25	0.06	0.05	42 – 50	26	25	20
St. 52 – 3.	0.22	0.05	0.05	52 – 62	36	35	22

● **Permissible dimensional variations :**

For pipe outside diameter (da) :

Up to 200 mm

± 1% (with a min of ± 0.5 mm)

Above 200 mm up to 1000 mm

± (0.005 da + 1) mm

Above 1000 mm

± 6 mm

For pipe lengths :

For fixed lengths : Permissible variation

± 500 mm

For exact lengths : Lengths up to 6 m

+ 10 mm

lengths above 6m

+ 15 mm

For wall thickness :

Up to 3 mm

+ 0.30 mm

– 0.20 mm

Above 3 mm and up to 10 mm + 0.45 mm

– 0.50 mm

For weight :

Per single pipe

+ 12%

– 8%

Per wagon load not less

+ 10%

than 10 ton

– 5%

● **testing :**

All pipes shall be tested by means of an internal pressure test. The test is carried out at pressure of 40 Kp/cm² max. By no account should the safety margin be less than 1.1 × calculated yield pressure. Any pipe fails to pass the pressure test should be rejected.

SPECIFICATIONS DIN 2440 & 2441

- * For welded and seamless pipes. Surface Black or galvanized.
- * Agree with specification ISO/R 65 – 1971.
- * Common manufacturing lengths for welded tubes :
$$6\text{m} \begin{matrix} + 100 \text{ mm} \\ - 50 \end{matrix}$$
- * Permissible variation in wall thickness :
– 12.5%
- * Permissible weight tolerance :
For a single tube : $\pm 10\%$
For a load of not less than 10 t :
 $\pm 7.5\%$

* * * *

SPECIFICATION ASTM A 53 – 82

● **Chemical and mechanical properties :**

Grade	Chemical composition %				Tensile strength	Yield strength
	C (max.)	Mn (max.)	P (max.)	S (max.)	(min. psi.)	(min. psi.) 0
A	0.25	0.95	0.05	0.06	48000	30000
B	0.30	1.20	0.05	0.06	60000	35000

Minimum elongation (%e) in 2 in. (50.8 mm.)
Specimen shall be determined by equation :

$$e = 625000 \frac{A^{0.2}}{U^{0.9}} \quad \text{where :}$$

A = Cross sectional area of tensile test specimen

U = Specified tensile strength, Psi

Hydrostatic testing :

Maximum specified hydrostatic test pressure shall not exceed 2500 psi (17.2 Mpa) for NPS (Normal pipe Size) 3 and under, or 2800 Psi (19.3 Mpa) for all NPS over 3. Hydrostatic pressure shall be maintained for not less than

5 seconds for all sizes of pipes. Each length of pipe shall be subjected to the hydrostatic test. Duration of applying pressure shall be enough to examine the whole length of the weld seam. Test pressure shall vary according to the variation in wall thickness.

Nominal Size	Outside Diameter		Wall Thickness			Weight		Test Pressure			
								Grade A		Grade B	
								psi	kg/cm ²	psi	kg/cm ²
in	in	mm	in	mm	Sch.No.	lbs/ft	Kg/m				
1/8	0.405	10.3	0.068	1.73	40(STD)	0.24	0.36	700	49	700	49
			0.095	2.41	80(XS)	0.31	0.46	850	60	850	60
1/4	0.540	13.7	0.088	2.24	40(STD)	0.42	0.62	700	49	700	49
			0.119	3.02	80(XS)	0.54	0.80	850	60	850	60
3/4	0.675	17.1	0.091	2.31	40(STD)	0.57	0.85	700	49	700	49
			0.126	3.20	80(XS)	0.74	1.10	850	60	850	60
1/2	0.840	21.3	0.109	2.77	40(STD)	0.85	1.26	700	49	700	49
			0.147	3.73	80(XS)	1.09	1.62	850	60	850	60
3/4	1.050	26.7	0.113	2.87	40(STD)	1.13	1.68	700	49	700	49
			0.154	3.91	80(XS)	1.47	2.19	850	60	850	60
1	1.315	33.4	0.133	3.38	40(STD)	1.68	2.50	700	49	700	49
			0.179	4.55	80(XS)	2.17	3.23	850	60	850	60
1 1/4	1.660	42.2	0.140	3.56	40(STD)	2.27	3.38	1000	70	1100	77
			0.191	4.85	80(XS)	3.00	4.46	1500	105	1600	112
1 1/2	1.900	48.3	0.145	3.68	40(STD)	2.72	4.05	1000	70	1100	77
			0.200	5.08	80(XS)	3.63	5.40	1500	105	1600	112
2	2.375	60.3	0.154	3.91	40(STD)	3.65	5.43	2300	162	2500	176
			0.218	5.54	80(XS)	5.02	7.47	2500	176	2500	176
2 1/2	2.875	73.0	0.203	5.16	40(STD)	5.79	8.62	2500	176	2500	176
			0.276	7.01	80(STD)	7.66	11.40	2500	176	2500	176
3	3.500	88.9	0.216	5.49	40(STD)	7.58	11.28	2220	156	2500	176
			0.300	7.62	80(XS)	10.25	15.25	2500	176	2500	176
3 1/2	4.000	101.6	0.226	5.74	40(STD)	9.11	13.56	2030	143	2370	167
			0.318	8.08	80(XS)	12.51	18.62	2800	197	2800	197
4	4.500	114.3	0.237	6.02	40(STD)	10.79	16.06	1900	134	2210	155
			0.337	8.56	80(XS)	14.98	22.29	2700	190	2800	197
			0.438	11.12	120	19.00	28.30	2800	197	2800	197
5	5.563	141.3	0.258	6.55	40(STD)	14.62	21.76	1670	117	1950	137
			0.375	9.53	80(XS)	20.78	30.92	2430	171	2800	197
			0.500	12.70	120	27.04	40.24	2800	197	2800	197
6	6.625	168.3	0.280	7.11	40(STD)	18.97	28.23	1520	107	1780	125
			0.432	10.97	80(XS)	28.57	42.52	2350	165	2740	193
8	8.625	219.1	0.250	6.35	20	22.36	33.28	1040	73	1220	86
			0.277	7.04	30	24.70	36.76	1160	82	1350	95
			0.323	8.18	40(STD)	28.55	42.49	1340	94	1570	110
			0.406	10.31	60	35.64	53.09	1700	120	2000	141
			0.500	12.7	80(XS)	43.39	64.57	2090	147	2430	171

Nominal Size	Outside Diameter		Wall Thickness		Sch.No.	Weight		Test Pressure			
								Grade A		Grade B	
In	In	mm	In	mm		lbs/ft	Kg/m	psi	kgf/cm ²	psi	kgf/cm ²
10	10.750	273.0	0.250	6.35	20	28.04	41.73	840	59	980	69
			0.279	7.09		31.20	46.43	930	65	1090	77
			0.307	7.80	30	34.24	50.95	1.030	72	1200	84
			0.365	9.27	40 (STD)	40.48	60.24	1.220	86	1430	101
			0.500	12.7	60 (XS)	54.74	81.46	1.670	117	1950	137
12	12.750	323.8	0.250	6.35	20	33.38	49.67	710	50	820	58
			0.330	8.38	30	43.77	65.14	930	65	1090	77
			0.375	9.53	(STD)	49.56	73.75	1.060	75	1240	87
			0.406	10.31	40	53.52	79.72	1.150	81	1340	94
			0.500	12.70	(XS)	65.42	97.36	1.410	99	1650	116
			0.562	14.27	60	73.13	108.96	1.590	112	1850	130
14	14.000	355.6	0.250	6.35	10	36.71	54.63	640	45	750	53
			0.312	7.92	20	45.61	67.94	800	56	940	66
			0.375	9.53	30 (STD)	54.57	81.21	960	67	1120	79
			0.438	11.12	40	63.44	94.49	1.130	79	1310	92
			0.500	12.70	(XS)	72.09	107.28	1.290	91	1500	105
			0.594	15.09	60	85.05	126.72	1.530	108	1790	126
16	16.000	406.4	0.250	6.35	10	42.05	62.58	560	39	660	46
			0.312	7.92	20	52.27	77.86	700	49	820	58
			0.375	9.53	30 (STD)	62.58	93.13	840	59	980	69
			0.500	12.70	40 (XS)	82.77	123.18	1.120	79	1310	92
18	18.000	457.2	0.250	6.35	10	47.39	70.52	500	35	580	41
			0.312	7.92	20	58.94	87.79	620	44	730	51
			0.375	9.53	(STD)	70.59	105.05	750	53	880	62
			0.438	11.12	30	82.15	122.36	880	62	1020	72
			0.500	12.70	(XS)	93.45	139.07	1.000	70	1170	82
			0.562	14.27	60	104.67	155.91	1.120	79	1310	92
20	20.000	508.0	0.250	6.35	10	52.73	78.54	450	32	520	37
			0.375	9.53	20 (STD)	78.60	117.07	680	48	790	56
			0.500	12.70	30 (XS)	104.13	155.10	900	63	1050	74
			0.594	15.09	40	123.11	183.43	1.170	82	1250	88
24	24.000	609.6	0.250	6.35	10	63.41	94.37	380	27	440	31
			0.375	9.53	20 (STD)	94.62	140.81	560	39	660	46
			0.562	14.27	30	140.68	209.36	840	59	980	69
			0.688	17.48	40	171.29	254.91	1.030	72	1200	84

Tolerances :

In outside diameter : $\pm 1\%$

In length : $+ \frac{1}{4}$ = than specified length

In weight : $\pm 10\%$ for all wall thicknesses

In wall thickness : Thickness at any point must not be more than 12.5% under the specified wall thickness.

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SPECIFICATION ASTM A 53 – 82

Material : steel produced from open – hearth, basic oxygen, or electric – furnace. Max. permissible % P = 0.050

Mechanical properties :

	Grade 1	Grade 2	Grade 3
Tensile strength (psi) min.	50000	60000	66000
Yield point (psi) min.	30000	35000	45000
Minimum elongation for wall Thickness $\frac{5}{16}$ in. and over :			
Elongation in 8 in. min. %	18	14	
Elongation in 2 in. min. %	30	25	20

Minimum wall thickness on inspection (tm) in. :

Is calculated from the equation :

$$t_m = t_n \times 0.875 \quad \text{where :}$$

t_n = nominal (average) wall thickness, in.

Common sizes and weight per foot :

TABLE 3

Length Tolerances for Structural Tubing

Outside Diam. (in.)		6 inch					8 inch	
Nominal	Thick (in.)	0.134	0.141	0.156	0.164	0.172	0.141	0.172
Weight /	Foot (lb.)	8.39	8.82	9.74	10.28	10.71	11.83	14.38

A 252 – 82

Minimum Wall Thickness on Inspection

tn = Nominal (average) wall thickness (in.)

tm = Minimum wall thickness (in.)

tn	tm	tn	tm	tn	tm	tn	tm
0.068	0.060	0.237	0.207	0.432	0.378	1.062	0.929
0.088	0.077	0.250	0.219	0.436	0.382	1.094	0.957
0.091	0.080	0.258	0.226	0.437	0.382	1.125	0.984
0.095	0.083	0.276	0.242	0.438	0.383	1.156	1.012
0.109	0.095	0.277	0.242	0.500	0.438	1.219	1.067
0.113	0.099	0.279	0.244	0.531	0.465	1.250	1.094
0.119	0.104	0.280	0.245	0.552	0.483	1.281	1.121
0.125	0.109	0.281	0.246	0.562	0.492	1.312	1.148
0.126	0.110	0.294	0.257	0.594	0.520	1.343	1.175
0.133	0.116	0.300	0.262	0.600	0.525	1.375	1.203
0.140	0.122	0.307	0.269	0.625	0.547	1.406	1.230
0.145	0.127	0.308	0.270	0.656	0.574	1.438	1.258
0.147	0.129	0.312	0.273	0.674	0.590	1.500	1.312
0.154	0.135	0.318	0.278	0.688	0.602	1.531	1.340
0.156	0.136	0.322	0.282	0.719	0.629	1.562	1.367
0.179	0.157	0.330	0.289	0.750	0.656	1.594	1.395
0.187	0.164	0.337	0.295	0.812	0.710	1.750	1.531
0.188	0.164	0.343	0.300	0.844	0.739	1.781	1.558
0.191	0.167	0.344	0.301	0.864	0.756	1.812	1.586
0.200	0.175	0.358	0.313	0.875	0.766	1.968	1.722
0.203	0.178	0.365	0.319	0.906	0.793	2.062	1.804
0.216	0.189	0.375	0.328	0.938	0.821	2.344	2.051
0.218	0.191	0.382	0.334	0.968	0.847		
0.219	0.192	0.400	0.350	1.000	0.875		
0.226	0.198	0.406	0.355	1.31	0.902		

● **Permissible variations :**

● **Weight :** The weight of any length of pile shall not vary more than 15% over or 5% under the prescribed weight. Each length shall be weighed separately.

● **Diameter :** The outside diameter of steel pipe piles shall not vary more than $\pm 1\%$ from the diameter specified.

● **Thickness :** The minimum wall thickness at any point shall not be more than 12.5% under the nominal wall thickness specified.

● **Length :** Pipe piles shall be ordered either single or double random lengths, or in uniform lengths, and shall be furnished as follows :

Single random lengths : 16 – 25 ft.

Double random lengths : over 25 ft with a minimum average of 35 ft.

Uniform lengths as specified with a tolerance of ± 1 in.

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SPECIFICATION ASTM A 500 For Welded Pipe Piles

● **Scope :**

This specification covers nominal (average) wall steel tubing manufactured from carbon steel, as round, square, rectangular, or special shape structural tubing, aimed for general structural purposes. This tubing is produced with a maximum wall of 0.625 in. (15.88 mm).

● **Manufacture :**

Welded tubing shall be made from flat rolled steel by the electric – resistance welding process. It is normally furnished without removal of inside flash. The tubing may be stress relieved or annealed as is considered necessary by the manufacturer to conform to the requirements of this specification .

● **Chemical analysis :**

Analysis of each heat of open hearth, basic – oxygen, or electric – furnace steel shall be made by the manufacturer. The chemical composition shall conform to the requirements mentioned in table(1).

An analysis may be made by the purchaser from finished tubing manufactured in accordance with this specification, or an analysis may be made from flat – rolled stock from which the Welded tubing is manufactured. When product analyses are made, two sample lengths from a lot of each 500 lengths or fraction thereof shall be selected. In the event the chemical composition of one of the sample lengths does not conform to the requirement shown in table (1) for product analyses, an analysis of two additional lengths selected from the same lot shall be made each of which shall conform to the requirements, or the lot is subject to rejection .

Permissible variations in dimensions

● **Outside dimensions :**

In case of round structural tubing, the outside diameter shall not vary more than $\pm 0.5\%$ rounded to the nearest 0.005 in. (0.13 mm) of the nominal outside diameter of the size specified, for nominal outside diameter:)
1.9 in. (48.26 mm).

and smaller, and $\pm 0.75\%$ rounded to the nearest 0.005 in. of the nominal outside diameter, for nominal outside diameters 2 in. (50.8 mm) and larger. The outside diameter measurements shall be made at positions, at least 2 in. (50.8 mm) from either end of the tubing.

For square and rectangular structural tubing, the allowances shall be as stated in table (4).

● **Wall thickness :**

The minimum wall thickness at any point of measurement on the tubing shall be not more than 10% less than the nominal wall thickness specified. The maximum wall thickness, excluding the weld seam, shall be not more than 10% greater than the nominal wall thickness specified.

● **Length :**

Structural tubing is normally produced in random mill lengths 5 ft (1.5 m) and over in multiple lengths. length allowances shall be as stated in table (3) .

Table (1) : Chemical Requirements

Element	Composition%			
	Grade A and B		Grade C	
	Heat analysis	product analysis	Heat analysis	product analysis
Carbon (max.)	0.26	0.30	0.23	0.27
Manganese (max.)	.	.	1.35	1.40
Phosphorus (max.)	0.04	0.05	0.04	0.05
Sulfur (max.)	0.05	0.063	0.05	0.063
Copper (min.) when specified	0.20	0.18	0.20	0.18

Table (2) : Tensile Requirements

a – Round Structural Tubing

	Grade A	Grade B	Grade C
Tensile strength (min.) psi(Mpa)	45000(310)	58000(400)	62000(427)
Yield strength (min.) psi (Mpa)	33000(228)	42000(290)	46000(317)
Elongation in 2 in. (50.8 mm) min.%	25	23	21

b – Shaped Structural Tubing

	Grade A	Grade B	Grade C
Tensile strength (min.) psi (Mpa)	45000(310)	58000(400)	62000(427)
Yield strength (min.) psi (Mpa)	39000(269)	46000(317)	50000(345)
Elongation in 2 in. (50.8 mm) min. %	25	23	21

Table (4) : Outside Dimension Tolerances for Square and Rectangular Tubing

Largest outside Dimension	± Tolerance
in. (mm)	in. (mm)
2 ½ (63.5 mm) and under	0.02 (0.51 mm)
Over 2 ½ (63.5 mm) to 3 ½ (88.9 mm)	0.025 (0.64 mm)
Over 3 ½ (88.9 mm) to 5 ½ (139.7 mm)	0.03 (0.76 mm)
Over 5 ½ (139.7 mm)	

TABLE 3 Length Tolerances for Structural tubing

	22 ft and less (6.7 m.)		more than 22 ft – 44 ft (6.7 – 13.4 m.)	
	more than	less than	more than	less than
Length tolerance (in.) (mm.)	½ (12.7)	¼ (6.4)	¾ (19)	¼ (6.4)

SPECIFICATION ASTM A 513

● **Electric – Resistance – Welded Carbon and Alloy steel Mechanical Tubing :**

Tubing may be furnished as : no final thermal treatment, stress relieved, and annealed or normalized. The flash shall be removed from the outside diameter of tubing. As for the welding flash on the inside diameter the height of the remaining welding flash is controlled so as not to exceed 0.01 in., for tubing with outside diameter exceeding 1 $\frac{1}{8}$ in. (28.5 mm).

An analysis of each heat of steel shall be made by the steel manufacturer to determine the percentages of the elements specified. When requested on the purchase order, a product analysis shall be made by the supplier, for each heat or lot. If the heat identity was traced properly, so one sample is taken from all products of this heat. If heat identity is not maintained, a sample shall be taken from one tube per 2000 ft (610 m.) or less for sizes over 3 in. (76.2 mm), and from one tube per 5000 ft (1525 m) or less for sizes 3 in. and under.

**Table (1) : Chemical Requirements for Standard
Low – Carbon x Steels**

Grade Designation	Composition %			Sulfur (max.)
	Carbon	Manganese	Phosphorus (max.)	
MT 1010	0.05 – 0.15	0.30 – 0.60	0.040	0.050
MT 1015	0.10 – 0.20	0.30 – 0.60	0.040	0.05
MTX 1015	0.10 – 0.20	0.60 – 0.90	0.040	0.05
MT 1020	0.15 – 0.25	0.30 – 0.60	0.040	0.05
MTX 1020	0.15 – 0.25	0.70 – 1.00		

Table (2) : Tolerances for Product Analysis

Element	Limit, or Max. of specified range, %	Variation, over the Max. limit or under the Min. limit	
		Under Min. %	Over Max., %
Carbon	to 0.15, incl.	0.02	0.03
	over 0.15 to 0.40, incl.	0.03	0.04
	over 0.40 to 0.55, incl.	0.03	0.05
Manganese	to 0.60, incl.	0.03	0.03
	over 0.60 to 1.15, incl.	0.04	0.04
	over 1.15 to 1.65, incl.	0.05	0.05
Phosphorus			0.01
Sulphur			0.01

Table (4) : length Tolerances for Square and Rectangular Tubing

Length, ft	Tolerance, in
1 to 3 , incl.	$\pm \frac{1}{16}$
Over 3 to 12, incl.	$\pm \frac{3}{32}$
Over 12 to 20, incl.	$\pm \frac{1}{8}$
Over 20 to 30, incl.	$\pm \frac{3}{16}$
Over 30 to 40, incl.	$\pm \frac{3}{8}$

**Table (3) : Tolerances of Dimensions
Square and Rectangular Tubing**

Largest nom. outside dimension, in.	Wall thickness, in.	Outside tolerance at all sides at corners, ± In
$\frac{3}{16}$ – $\frac{5}{8}$, incl.	0.02 – 0.083, incl.	0.004
Over $\frac{5}{8}$ to $1\frac{1}{8}$, incl.	0.025 – 0.156, incl.	0.005
Over $1\frac{1}{8}$ to $1\frac{1}{2}$, incl.	0.025 – 0.192, incl.	0.006
Over $1\frac{1}{2}$ to 2, incl.	0.032 – 0.192, incl.	0.008
Over 2 to 3, incl.	0.035 – 0.259, incl.	0.010
Over 3 to 4, incl.	0.049 – 0.259, incl.	0.020
Over 4 to 6, incl.	0.065 – 0.259, incl.	0.020
Over 6 to 8, incl.	0.185 – 0.259, incl.	0.025

Measured at corners at least 2 in. from the cut end of the tubing.

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SPECIFICATION OF CASTINGS

1 – Malleable black – heart cast iron

B.S 310 (1972) B 290/6 :		ISO 943 :		
Tensile strength	290 N/mm ²	Commercial name of C.I.	GTS – 35	GTS – 45
0.5% of proof stress	170 N/mm ²	Tensile strength (kg/mm ²)	35	45
Elongation	6%	Yield stress (kg/mm ²)	20	30
Brinell hardness	124/140	% ductility (%)	12	7

2 – Malleable white – heart cast iron

B.S. 309 (1972) W 410/4 :		ISO 942 :		
Tensile strength	350 N/mm ²	Commercial name of C.I.	GTW – 35	GTW – 40
0.5% of proof stress	190 N/mm ²	Tensile strength (kg/mm ²)	35	40
Elongation %	10 %	Yield stress (kg/mm ²)		22
Brinell hardness	120 /180	% ductility (%)	8	5

3 – Pearlitic malleable cast iron

B.S 3333 (1972) P 440/7 :		ISO 944 :			
Tensile strength	440 N/mm ²	Commercial name of C.I.	GTP – 45	GTP – 55	GTP – 65
0.2% of proof stress	290 N/mm ²	Tensile strength (kg/mm ²)	45	55	65
Elongation %	7% – 11%	Yield stress (kg/mm ²)	30	36	43
Brinell hardness	142/169	% ductility (%)	7	5	3

4 – Nodular cast iron

B.S. 2789 (1961) SNG 24/17 :	
Tensile strength	24 tons / in ²
0.5% of proof stress	15 tons / in ²
Elongation %	17%

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